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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/657,665	09/08/2003	Marie Angelopoulos	YOR920010135US2	2168
7590	03/10/2004		EXAMINER MOHAMEDULLA, SALEHA R	
Dr. Daniel P. Morris, Esq. IBM Corporation Intellectual Property Law Dept. P.O. Box 218 Yorktown Heights, NY 10598			ART UNIT 1756	PAPER NUMBER
DATE MAILED: 03/10/2004				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/657,665

Applicant(s)

ANGELOPOULOS ET AL.

Examiner

Saleha R. Mohamedulla

Art Unit

1756

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 08 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-47 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-32 and 39-47 is/are rejected.
- 7) ☒ Claim(s) 33-38 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

Art Unit: 1756

### **DETAILED ACTION**

Claims 1-47 are pending.

#### ***Specification***

1. The first line of the specification should be amended to include updated continuing application data, including any patent numbers.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 10 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 10 recites "z=0-0.7" in line 3, however, there is no "z" in the chemical formula.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1, 2, 6-8, 18, 20, 21, 23, 27, 28, 30, 31, 42 and 43 are rejected under 35

U.S.C. 102(b) as being anticipated by US# 5,952,128 to Isao et al.

Isao teaches a method of making a phase shift mask. Isao teaches sputtering a target of molybdenum silicide with a sputtering gas to form a phase shifting film on a transparent substrate (col. 2, lines 40-50). Isao teaches in an embodiment, that a base phase shifting film is formed on a substrate, and then a nitrided-oxide film of molybdenum silicide is formed as a surface layer on top of the base phase shifting film (col. 2, lines 50-60). Therefore, Isao teaches that the surface layer (nitrided-oxide film of molybdenum silicide) comprises a higher concentration of oxygen than that part of the phase shifting layer (the base phase shifting film). The base phase shifting film does not comprise oxygen. Isao teaches a metallic nitride as the base phase shifting film (col. 14, lines 35-37). Isao teaches providing a substrate, disposing a thin layer of phase shifting layer on the substrate, and forming a surface layer rich in oxygen on said phase shifting layer. Isao also teaches a phase shift of 180 degrees (col. 6, line 9). Isao also generally teaches transmission between about 3-40% at wavelengths of 248 nm and 50% at 488 nm (col. 1, lines 53-63; col. 2, lines 18-21). Molybdenum is in Group VI and silicon is in Group IV. The ratio of molybdenum to silicon in the molybdenum silicide sputter target is 1:2 (col. 6, lines 18-20). The phase shifting layer need not contain nitrogen and oxygen. A DC magnetron sputtering apparatus is used to sputter deposit the molybdenum silicide and nitrogen oxide (col. 6, lines 15-30). The substrate is stationary. The nitrogen oxide is mixed with argon and heated in air at an elevated temperature of 250 degrees Celsius (col. 6, lines 25-30; Table 1; Table 3). The heating is performed through thermal annealing.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 3-5, 9-17, 19, 22, 24-26, 29, 32 and 44-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,952,128 to Isao et al. in view of US# 5,955,223 to Mitsui et al.

Isao teaches the limitations discussed above. Isao teaches a molybdenum silicide target but does not teach a titanium silicide target.

Mitsui teaches a phase shift mask blank where the layer is formed using a titanium and silicon target (col. 18, lines 30-40). Oxygen and nitrogen gas is introduced into the sputtering chamber to form the titanium silicon nitrogen oxygen composition (col. 18, lines 45-50). Table 8 also shows the elemental compositional ratios and the various property values of the light semi-transmitting films of phase-shift mask blanks. In Table 8, Mitsui teaches the ratios recited in claims 10-12, 14 and 16. Mitsui teaches that the target is deposited using an RF magnetron sputtering method (col. 8, lines 35-40) and that the substrate was stationary. Because Mitsui teaches in Table 8 that the ratio in the target of titanium to silicon is 1:1 or 1:2, Mitsui teaches the target compositions recited in claims 19 and 22. Because oxygen and nitrogen gases are introduced in the chamber where the titanium silicon target is deposited, Mitsui teaches using two or more targets of different compositions. Mitsui teaches annealing the substrate to about 200 degrees Celsius to change the composition of the film (col. 8, lines 50-56). The heating is performed through thermal annealing.

Art Unit: 1756

The references are analogous art as they are drawn to sputter depositing metal-silicon targets in making phase shifting masks. It would be obvious to one of ordinary skill in the art to use the titanium-silicon target of Mitsui instead of the molybdenum-silicon target of Isao because Mitsui teaches the use of transition metal and silicon sputtering targets (col. 3, lines 15-45). Mitsui teaches the interchangeability of molybdenum (Abstract) and titanium (col. 3, lines 34-38) as transition metals to be used in the sputtering targets for making phase shift mask blanks. Mitsui teaches that transition metal and silicon targets allow semi-transmitting properties to be maintained while still allowing the formation of finer patterns when the mask is made (col. 3, lines 1-10). Therefore, one of ordinary skill in the art would expect similar processing results and have a reasonable expectation of success when using titanium instead of molybdenum.

5. Claims 39 and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,952,128 to Isao et al. in view of US# 6,335,124 to Mitsui et al. (herein Mitsui '124).

Isao teaches the limitations discussed above. Isao does not teach that the sputter target is made by hot isostatic pressing. Mitsui '124 teaches making a metal-silicon sputter target by using a hot isostatic press (col. 6, lines 8-15). The references are analogous art as they are drawn to sputter depositing metal-silicon targets in making phase shifting masks. It would be obvious to one of ordinary skill in the art to use the hot isostatic pressing of Mitsui '124 to make the sputter targets of Isao because Mitsui '124 teaches that this method is common in the art for making metal-silicon targets (col. 6, lines 8-20).

Art Unit: 1756

6. Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over US# 5,952,128 to Isao et al. in view of US# 5,955,223 to Mitsui et al., in further view of US# 6,335,124 to Mitsui et al. (herein Mitsui '124).

Isao in view of Mitsui teaches the limitations discussed above in paragraph 4. Isao in view of Mitsui does not teach that the sputter target is made by hot isostatic pressing. Mitsui '124 teaches making a metal-silicon sputter target by using a hot isostatic press (col. 6, lines 8-15). The references are analogous art as they are drawn to sputter depositing metal-silicon targets in making phase shifting masks. It would be obvious to one of ordinary skill in the art to use the hot isostatic pressing of Mitsui '124 to make the sputter targets of Isao in view of Mitsui because Mitsui '124 teaches that this method is common in the art for making metal-silicon targets (col. 6, lines 8-20).

#### ***Allowable Subject Matter***

7. Claims 33-38 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The prior art does not teach or suggest that the surface layer rich in oxygen is obtained by oxygen plasma bombardment or that the oxygen partial pressure during deposition is increased at the final stage of deposition.

#### ***Response to Arguments***

8. Applicant filed remarks with the preliminary amendment. Applicant argues that Isao does not teach that the surface layer is richer in oxygen than the part of the phase shifting layer

Art Unit: 1756


not included in the surface layer. Applicant's comments are drawn to Isao's teaching of two layers of nitrided-oxides of molybdenum silicide. Applicant does not address Isao's teaching in column 14 drawn to the first layer being a metallic nitride and the surface layer comprising a nitrided-oxide of molybdenum silicide. In addition, the claims do not require the "surface layer" to be on top of that part of the phase shifting layer not included in the surface layer. That is, the surface layer can be underlying the rest of the phase shifting layer. Therefore, Applicant's arguments are not persuasive.

### *Conclusion*

9. Any inquiry concerning this communication or earlier communications from the Examiner should be directed to Saleha Mohamedulla whose telephone number is (571) 272-1387. The Examiner can normally be reached Monday-Friday, from 8:00 AM to 4:30 PM.

If attempts to reach the Examiner by telephone are unsuccessful, the Examiner's supervisor, Mark Huff, can be reached on (571) 272-1385. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

  
MOHAMEDULLA, SALEHA R.  
PATENT EXAMINER

Technology Center 1700  
February 27, 2004